

# Notice of Allowability

Application No.

10/656,802

Examiner

Alan Diamond

Applicant(s)

SCHER ET AL.

Art Unit

1753

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the amendments filed August 23, 2004 and September 21, 2004.
2. ☒ The allowed claim(s) is/are 1,4,5,8, 9, 11-47,50-58,60-73 and 76-93.
3. ☒ The drawings filed on 04 September 2003 are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☐ All    b) ☐ Some\*    c) ☐ None    of the:
  1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.  
**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
  6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
    - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
    - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

## Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08),  
Paper No./Mail Date \_\_\_\_\_
4. ☐ Examiner's Comment Regarding Requirement for Deposit  
of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☒ Interview Summary (PTO-413),  
Paper No./Mail Date 11302004.
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other \_\_\_\_\_.

Alan Diamond  
Primary Examiner  
Art Unit: 1753

### EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Mr. Andrew Filler on December 1, 2004.

The application has been amended as follows:

#### In The Claims

Claim 1. (currently amended) A photovoltaic device, comprising:

- a first electrode layer;
- a second electrode layer; and,
- a first photoactive layer disposed between the first and second electrode layers, wherein the photoactive layer is disposed in at least partial electrical contact with the first electrode along a first plane, and in at least partial electrical contact with the second electrode along a second plane, and wherein the photoactive layer comprises a first inorganic material and a second inorganic material different from the first inorganic material, which first and second inorganic materials that exhibit[[s]] a type II band offset energy profile, and wherein the photoactive layer comprises a first population of nanostructures comprising nanorods comprising the first inorganic material which are not grown from ~~the first or second electrode layer~~ any layer in the photovoltaic device and a second population of nanostructures comprising the second inorganic material,

~~and each having at least one elongated section oriented predominantly normal to at least the first plane and wherein some of the nanorods of the photoactive layer do not directly contact any other layer in the photovoltaic device.~~

Claim 9. (currently amended) The photovoltaic device of claim 1, wherein the population of nanorods comprises a core of ~~[[a]] the first semiconductor~~ inorganic material and a shell of ~~a second semiconductor~~ another inorganic material~~[[.]] which second semiconductor material is different from the first semiconductor material.~~

Please cancel claim 10.

In claim 11, at line 1, please delete "10" and insert in its place --9--.

In claim 12, at line 1, please delete "10" and insert in its place --9--.

In claim 32, at line 2, please delete "population" please insert in its place --first and second populations--.

In claim 32, bridging lines 2 and 3, please delete "comprises at least a second different nanocrystal subpopulation, the second nanocrystal subpopulation having" and insert in its place --have--.

In claim 32, at line 4, please delete "than the nanorods".

In claim 33, at line 2, please delete "nanorods and the second nanocrystal subpopulation" and insert in its place --first and second populations of nanostructures--.

In claim 34, at line 2, please delete "nanorods and the second nanocrystal subpopulation" and insert in its place --first and second populations of nanostructures--.

In claim 35, at line 2, please delete "at least" and insert in its place --more than--.

In claim 36, at line 3, please delete "a first" and insert in its place --the first--.

In claim 36, at line 4, please delete "a second" and insert in its place --the second--.

In claim 37, at line 2, please delete "at least" and insert in its place --more than--.

In claim 47, at line 12, please delete "the first or second electrode layer" and insert in its place --any layer in the photovoltaic device--.

In claim 47, at line 13, please delete "material" and insert in its place --material, and wherein some of the nanotetrapods of the photoactive layer do not directly contact any other layer in the photovoltaic device--.

In claim 53, at line 2, please delete "comprise" and insert in its place --comprises--.

2. The following is an examiner's statement of reasons for allowance: Instant claims 1 and 47 have been amended so as to require that some of the nanorods of the photoactive layer do not directly contact any other layer in the photovoltaic device. This limitation is supported, for example, by instant Figures 1 and 3C, where it is seen that a portion of the nanorods (or nanotetrapods) of the photoactive layer (102) do not and would not directly contact any other layer, such as layers 108, 110, 116, or 306, in the photovoltaic device. Instant claims 1 and 47 also require that the nanorods or nanotetrapods are not grown from any layer in the photovoltaic device. This limitation is supported by paragraphs 0190 to 0195 in the instant specification, as well as instant Examples 1 and 2 at pages 55-59 of the specification, which teach growth of nanocrystals. In particular, in said Examples 1 and 2, the nanocrystals are not grown from any layer in the device, but rather are first grown separate from the photovoltaic

device and then added to the photovoltaic device. Note in Example 1 that CdSe nanocrystals are first prepared and then blended with a polymer, and then spin-coated into the device.

In Motohiro et al (US 5,571,612), the only example of where a photovoltaic device is prepared is Example 3 at cols. 8-9. This example prepares the nanocrystal structure of Figure 3, wherein the CdS and CdTe particulates extend "from the surface of the substrate to the surface of the film" (see col. 8, lines 50-51), and thus, all of the particulates will directly contact any layer above and below the particulates. Furthermore, the particulates are grown from the substrate (1) beneath them. As noted above, instant claims 1 and 47 require some of the nanorods of the photoactive layer do not directly contact any other layer in the photovoltaic device, and that the nanorods or nanotetrapods are not grown from any layer in the photovoltaic device.

In Kalkan et al (US 2002/0192441) and Den et al (US 6,649,824), the nanorods or nanotetrapods directly contact a layer in the device and are grown from said layer. In Curtin (US 2004/0003838), although the nanorods (38) are not grown from any layer in the device, they do directly contact both electrodes (34,40) (see Figure 3). Figure 2B of Curtin is not a photovoltaic device, but rather shows how the nanorods are made in a die (20) having openings (22). The nanoparticles of Yoshikawa (US 2002/0040728) are not nanorods or nanotetrapods, and there is no teaching or suggestion of using nanorods of one inorganic type II band offset material in addition to a second different type II band offset material.

Alivisatos et al (US 2003/0145779) teaches nanoparticles and their method of manufacture, but does not teach or suggest the instant photovoltaic device. Instant inventor Erik Scher is an inventor in this publication, which has published from 10/301,510. There is no (provisional) obviousness-type double patenting with the claims of 10/301,510.

The provisional obviousness-type double patenting rejection over copending application Serial No. 10/778,009 is expressly withdrawn by the Examiner since it is the only remaining issue (see MPEP 822.01).

The following U.S. Patent Application Publications are hereby made of record:

Alivisatos et al (US 2003/0226498) teaches a photovoltaic device with a photoactive layer in which nanorods or nanotetrapods are dispersed in a polymer. The nanorods or nanotetrapods can be oriented (see paragraphs 0069, 0111, 0112, 0115, 0121, and Figure 19b). However, Alivisatos et al does not specifically teach or suggest a photoactive layer that uses both first and second different inorganic materials that exhibit a type II band offset energy profile. Alivisatos et al's photoactive layer can be nanorods or nanotetrapods made from a single inorganic material and dispersed in an organic polymer (see paragraphs 0065 to 0068). Not all of the inorganic materials disclosed by Alivisatos et al in paragraph 0065 are type II materials. Furthermore, there is never any teaching or suggestion in Alivisatos et al of using a second population of nanostructures, wherein said second population comprises the second inorganic material. Furthermore, although it is acknowledged that Alivisatos et al is not limited to its Examples, it must be noted that all of Alivisatos et al's examples (see paragraphs

Art Unit: 1753

0126 to 0155) use a single inorganic material for the nanorods or nanotetrapods in the photoactive layer of the device.

Kim, II (US 2004/0109666) prepares optoelectronic devices using fibers (18,40) that are not nanorods or nanotetrapods (see paragraph 0134). In paragraph (0119), Kim, II teaches a coating layer (288) containing a conventional blend of polymer and CdSe nanorods. In such a conventional blend, there is no second inorganic material.

Zeira (US 2003/0102024) uses rods as seen in Figure 3, or an electrical tree discharge pattern as seen in Figure 3, but does not teach or suggest the instantly claimed invention.

The optoelectronic device in Sager et al (US 2004/0084080) has both a porous template (206) and a pore-filing material (208) directly contacting other layers in the device (see Figures 2 and 4D-4F).

US 2004/0095658 (which is already of record), US 2004/0146560, and US 2004/0178390 have matured from copending applications 10/656,916, 10/656,911 and, 10/656,910, respectively. There is no (provisional) obviousness-type double patenting with the claims in these copending applications.

All of the references referred to in the third party protest filed 08/03/2004 are of record in the instant application.

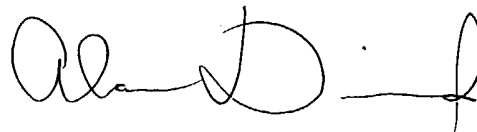
Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Art Unit: 1753

3. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alan Diamond whose telephone number is 571-272-1338. The examiner can normally be reached on Monday through Friday, 5:30 a.m. to 2:00 p.m. ET.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'Alan Diamond', with a stylized flourish at the end.

Alan Diamond  
Primary Examiner  
Art Unit 1753

Alan Diamond  
November 30, 2004